American Automobile Manufacturers Association

CHRYSLER CORPORATION · Ford · General Motors

ANDREW H. CARD, Jr.
President and Chief Executive Officer

May 28, 1996

Mr. William F. Caton, Acting Secretary
Federal Communications Commission
1919 M. Street. N. W., Room 222
Washington, DC 20554

Dear Mr. Caton:

RE: Comments to Federal Communications Commission, Docket 94-124; RM-8308; FCC 95-499 - Operation Above 40 GHz - Second Notice of Proposed Rule Making (NPRM)

The American Automobile Manufacturers Association (AAMA) submits the following comments for FCC review as adopted December 15, 1995, and released December 15, 1995 [FR Doc. 96-7688 Filed 3-28-96].

AAMA strongly supports harmonizing frequency bands for vehicular radar as the public would benefit through worldwide compatibility with other electronic products operating in the same or adjacent frequencies. Our comments for the specific docket follow.

General Comments

AAMA would like to take this opportunity revise our request for frequencies for vehicular radar systems as outlined in Docket 94-124.

As noted in appendix A of FCC Docket 95-499, the FCC is deferring to a later date any action on other proposed frequencies bands requested in the NPRM, Docket 94-124. AAMA would like to continue our request for the 152-154 GHz band for vehicle radar application, but drop our request for the 95 GHz band. When the original request was submitted by AAMA, some designs were being considered for the 95 GHz band. However, since that time, economies of scale and design improvements have removed the need for the 95 GHz band. AAMA wishes to reinforce our request for the 152-154 GHz band because motor vehicle styling and weight considerations will continue to apply pressure for shifting vehicular radar systems to higher frequencies

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Comments to Second NPRM, ET Docket 95-124, FCC 95-499

The second NPRM included in ET Docket 95-124, FCC 95-499 requests comments for which two areas are of importance to the AAMA: 1)the temporary exclusion of Amateurs from the 76 GHz band and 2) emissions above 200 GHz.

Temporary Exclusion of Amateurs

The issue of in-band interference is the subject of several studies world wide. Both the European Automotive Radar Specification (EARS) Group and the Institute of Electrical and Electronic Engineers (IEEE) Radar Standards Subcommittee are pursuing test methods to measure the effects of in-band and out-of -band interference on vehicular radars. It is expected that the EARS study will be completed by the end of 1996. Based on the EARS work, the IEEE is charged to generate any additional tests required to validate these results. Until these and other similar studies are completed and useable standards developed, the AAMA agrees with the FCC to make the 76 to 77 GHz band temporarily exclusive as proposed in the NPRM, and upgrade the status of the Amateur Radio Service in the 77.5-78 GHz band from secondary to co-primary with government and non-government services. In this way, a plan of action can be established which will allow future reconsideration of this exclusion.

Emissions above 200 GHz

As a Part 15 device, the vehicle radars are required not to interfere with other users of the spectrum such as Radio Astronomers. It is for this reason that as soon as it was realized that a potential interference issue existed with the third harmonic of the 76 GHz systems, we started a dialogue with the radio astronomy community. It is through this ongoing dialog theat AAMA hopes to demonstrate that the vehicle radars do not pose a threat to the 217- 231 GHz band.

The measurement of emissions above 200 GHz has presented an interesting problem to the industry. Members of the AAMA have been investigating feasibility of making measurements in the 230 GHz range at several pW/cm2 . Test equipment manufacturers, including HP and Millitech, and the National Institute of Standards and Technology (NIST) have been contacted with no success in finding suitable equipment or test capability. Measurements were attempted at Kitt Peak National Radio Astronomy Observatory in Tucson, AZ using their helium cooled laboratory receivers with the radar system removed from a vehicle. Two different tests were run with 50 dB difference in outcome, the maximum being 1100 pW/cm2 (details in Appendix A).

With this magnitude of variation and lack of commercial measurement equipment, the AAMA is very interested in pursuing the avoidance of limits through demonstration. Harmful interference in the Radio Astronomy community has been defined in International Telecommunications Union(ITU)/International rRadio Consultative Committee Recommendation
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ITU-R RA 769 (1992). The harmful interference limit has been standardized as the received emission level that will produce a 10 % gain in root-mean-square noise fluctuations during an integration of 2000 s duration when received in the 0 dB sidelobe of the telescope.[1]

Because of ignition noise from vehicles and other RF sources, most radio astronomy sites control access to the facility to about 1 km. Using the 1 km range, Mr. Clegg, in the referenced document, calculated a limit of 74 pW/cm^2 based on this criteria. During this calculation it was assumed that the vehicle radar main beam was directed at the telescope. This condition can only exist if the vehicle is traveling on a road perpendicular to the site. Given the normal speed of moving vehicles and the requirement that a stationary vehicle radar must reduce its output by 25 dB, the probability of interference to an observation is low. Either the vehicle radar beam will quickly pass out of the range of the site or automatically reduce its output below the minimum interference level.

Through additional discussions between the affected parties, it should be possible to allow vehicle radar manufacturers to avoid limits above 200 GHz by demonstrating, in collaboration with the National Telecommunications Information Administration (NTIA) and radio astronomy users, that there would be a low probability of interference because of the angular distribution of the vehicle radar system and the susceptibility of radio astronomy equipment to off-axis signals. With the current state of instrumentation and lack of good test measurement techniques and constraint on output power at lower frequencies, the AAMA feels that this approach would be beneficial to an orderly introduction of these radar products to the public at a reasonable cost.

If the FCC ultimately decides that extension of limits is necessary, they should be set at the 1000 pW/cm^2 level proposed in the NPRM. The variability of the few measurements that have been made indicates that setting a limit below 1000 pW/cm^2 will severely impede the introduction of vehicle radar products and nullify the good work the FCC has done in authorizing the frequency band for vehicle radars.

Please contact me at the Association (313) 871-6334 if you require additional information concerning any aspect of these AAMA comments.

Sincerely,

Vann H. Wilber, Director
Vehicle Safety and International Department
Engineering Affairs Division

[1] Page 4 IEEE VRS-96-6, IEEE Vehicular Radar Standards Subcommittee, authored by Andrew Clegg of the Naval Research Laboratory.

Appendix A

Because of the lack of commercial equipment, an experiment to measure 3rd harmonic emissions was performed at Kitt Peak National Radio Astronomy Observatory (NRAO) in Tucson AZ using an AAMA member's experimental vehicle radar system. These measurements were made in the NRAO laboratory where work on the NRAO helium cooled receivers is performed. Two different measurement techniques were tried with widely varying results. In both methods the radar assembly was removed from the vehicle because of the location and size of the laboratory.

In the first method, a reflecting plate was placed in front of the radar to reflect the power into the 8-beam receiver. One channel of the receiver was used as a reference. The receiver was calibrated using cold (liquid nitrogen) and hot (RF absorber at room temperature) sources to determine the receiver noise temperature. The radar was positioned 80 inches from the 8-beam focal plane and rotated to peak the received power. Knowing the receiver noise temperature and the total power measured with the radar on, the 3rd harmonic power of the radar can be inferred. Assumptions made in the technique include calculating the effective aperture of the 8-beam receiver antenna and extrapolating the 80 inch distance to three meters. This technique indicated a power density well below 2 pW/cm2.

The second method used the same equipment and t. The equipment was calibrated using a reference signal source. This technique allows substitution of the two power levels, the known source and the unknown source. While this technique eliminates the assumptions in calculating the 8-beam receiver effective antenna gain, it requires the calculation of the radiated power density in the antenna beam from the known reference source. This measurement technique resulted in a calculated 1100 pW/cm2 power density for the radar unit. No further testing was done to resolve this divergence and NRAO had no explanation for the differences in the two tests.